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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/732,953	12/11/2003	Mark Charles Hakey	ROC920030270US1	9243

30206 7590 11/10/2005

IBM CORPORATION
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EXAMINER

ZARNEKE, DAVID A

ART UNIT	PAPER NUMBER
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2891

DATE MAILED: 11/10/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/732,953

Applicant(s)

HAKEY ET AL.

Examiner

David A. Zameke

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 August 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-14 and 19-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-14 and 19-23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____

DETAILED ACTION

Election/Restrictions

The restriction requirement of 8/30/05 has been removed. Therefore, all of the pending claims 1-14, 19-23 will be examined below.

Drawings

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: 120, 121, 123, 125, 126 as noted on page 2, lines 19 and 20. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-11, 13, 14, 22 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's admitted prior art Figure 1 in view of Wu, US Patent 5,994,178.

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Applicant's admitted prior art (APA) Figure 1 teaches a method of forming shallow trench isolation (STI) regions comprising:

forming a plurality of active regions on a silicon substrate [102];

forming a shallow trench isolation region between a first and a second active region from the plurality of active regions; and

depositing silicon dioxide [112] in the shallow trench isolation region.

APA fails to teach selectively depositing the silicon dioxide in the STI region without depositing the silicon dioxide on the first and second active regions.

Wu teaches filling STI trenches with an LPD oxide (3, 8+).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the LPD oxide of Wu in the invention of APA because Wu teaches the use of an LPD oxide to fill the STI trench produces a planar surface and lower budgets (1, 61+).

Regarding claim 2, Wu the silicon dioxide is deposited by liquid phase deposition of the silicon dioxide (3, 8+).

With respect to claim 3, APA teaches the silicon substrate includes:

a silicon substrate [112];

a buried oxide layer [104] on the silicon substrate; and

a silicon-on-insulator layer [106] on the buried oxide layer-and from which the active regions are formed.

As to claim 4, APA teaches forming a pad oxide layer [108] on the silicon-on-insulator layer.

In re claim 5, while APA fails to teach the pad oxide layer has a thickness of between approximately 2 nm and approximately 10 nm, it would have been obvious to one ordinary skill in the art at the time of the invention to optimize the pad oxide layer thickness (MPEP 2144.05).

Regarding claim 6, APA teaches forming a pad nitride layer [110].

With respect to claim 7, while APA fails to teach the pad nitride layer has a thickness of between approximately 10 nm and approximately 150 nm, it would have been obvious to one ordinary skill in the art at the time of the invention to optimize the pad oxide layer thickness (MPEP 2144.05).

As to claim 8, while APA fails to teach cleaning the shallow trench isolation region before selectively depositing silicon dioxide, the cleaning of the cleaning the shallow trench isolation region before selectively depositing silicon dioxide is a conventional step known to a skilled artisan. This is further alluded to in the specification (page 7, lines 24+) of this application. The use of conventional materials to perform there known functions in a conventional process is obvious (MPEP 2144.07).

In re claim 9, while APA fails to teach cleaning the shallow trench isolation region reduces an amount of native oxide present along each exposed wall of the shallow trench isolation region, this is a conventional step known to a skilled artisan. The use of conventional materials to perform there known functions in a conventional process is obvious (MPEP 2144.07).

Regarding claim 10, APA teaches the shallow trench isolation region extends through the pad nitride layer and the silicon-on-insulator layer to reach the buried oxide layer (figure 1).

With respect to claim 11, Wu teaches the selective depositing the silicon dioxide further include depositing the silicon dioxide so that the silicon dioxide nucleates on and grows from the buried oxide layer (3, 8+).

In re claim 13, Wu teaches processing the selectively deposited silicon dioxide to provide a density substantially similar to a density of thermally grown silicon dioxide (3, 20+).

Regarding claim 14, Wu teaches processing the selectively deposited silicon dioxide further includes annealing the selectively deposited silicon dioxide at a temperature between approximately 800°C and approximately 1500 °C (3, 20+).

With respect to claim 22, APA teaches forming a pad oxide layer [108] between the pad nitride layer [110] and the silicon-on-insulator layer [106].

As to claim 23, while APA fails to teach the pad oxide layer has a thickness of between approximately 2 nm and approximately 10 nm, it would have been obvious to one ordinary skill in the art at the time of the invention to optimize the pad oxide layer thickness (MPEP 2144.05).

Claims 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's admitted prior art Figure 1 in view of Chu et al., US Patent 5,851,900.

While APA fails to teach overfilling the shallow trench isolation region with an excess amount of silicon dioxide during selective deposition; and planarizing the

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shallow trench isolation region by removing the excess amount, the overfilling and planarizing of the LPD oxide is commonly known in the art, as taught by Chu et al., US Patent 5,851,900 (Figures 7 and 8 & 4, 20-30 & 4, 60+). A skilled artisan knows that a planar surface is highly desired. The use of conventional materials to perform there known functions in a conventional process is obvious (MPEP 2144.07).

Claims 19-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's admitted prior art Figure 1 in view of Wu, US Patent 5,994,178.

Applicant's admitted prior art (APA) Figure 1 teaches a method of forming shallow trench isolation (STI) regions comprising:

- forming a plurality of active regions on a silicon substrate [102];

- forming a shallow trench isolation region between a first and a second active region from the plurality of active regions; and

- depositing silicon dioxide [112] in the shallow trench isolation region.

APA fails to teach selectively depositing the silicon dioxide in the STI region by liquid phase deposition of the silicon dioxide.

Wu teaches filling STI trenches with an LPD oxide (3, 8+).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the LPD oxide of Wu in the invention of APA because Wu teaches the use of an LPD oxide to fill the STI trench produces a planar surface and lower budgets (1, 61+).

With respect to claim 20, Wu teaches selectively depositing the silicon dioxide avoids depositing the silicon dioxide on the first and second active regions.

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As to claim 21, APA teaches the silicon substrate includes:

a silicon substrate [112];

a buried oxide layer [104] on the silicon substrate; and

a silicon-on-insulator layer [106] on the buried oxide layer-and from which the active regions are formed.

Conclusion

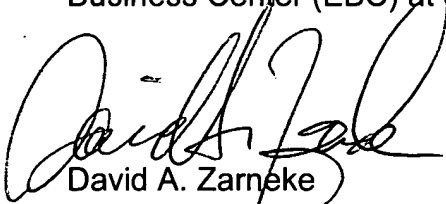
The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The art cited but not relied upon all teach the use of LPD oxide to fill an STI trench.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David A. Zarneke whose telephone number is (571)-272-1937. The examiner can normally be reached on M-Th 7:30 AM-6 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, William Baumeister can be reached on (571)-272-1722. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'David A. Zarneke', is written over the printed name.

David A. Zarneke
Primary Examiner
November 8, 2005